Velocity of wind = 25·7 kilometres per hour = 428 m. per minute.
Thermal emissivity of leaf-surface in still air = 0·0150 cal.
Thermal emissivity (e) in air of velocity of 428 m. per minute = 0·0150 + 0·00017 × 428 = 0·0577 calorie.
Hence mean temperature of leaf *above* that of surroundings = $r/2e$ = 0·0502/2 × 0·0577 = 0°·43 C.

The disposal of the incident radiant energy deduced from these data is given in the next table, the total incident energy R being taken at 100.

CASE A.—*Disposal of Incident Solar Energy by leaf of Helianthus annuus.*

w	Energy used for photosynthesis	0·66
W	,, ,, transpiration	48·39
W + w	Total energy expended in internal work ...	·05
R − Ra	Solar energy transmitted by leaf	31·40
r	Energy lost by thermal emission	19·55
		100·00

We will not consider another case in which the facilities for the performance of the internal work of vaporisation of water were more than sufficient to use up the whole of the direct solar radiation absorbed by the leaf, *i.e.* Ra was less than W + w.

Such conditions are afforded by fully opened stomata, high temperature, and a low degree of humidity of the air. The leaves used were again those of the sunflower, but in this case one-half of the solar radiation was intercepted by the revolving sectors.

CASE B.—*Helianthus annuus.*

Solar radiation incident on leaf R ... ... = 0·2746 calorie
Coefficient of absorption, a = 0·686, ∴ solar energy intercepted, Ra ... ... = 0·1884 ,,
Water vaporised = 0·000618 gram, ∴ W, the internal work of vaporisation = 0·000618 × 592 6 ... ... = 0·3668 ,,
Rate of photosynthesis = 0 000657 c.c. CO_2, hence w, absorption of energy due to assimilation ... . = 0·0033 ,,

Ra = (W + w) − r
0·1884 = 0·3668 + 0·0033 − 0·1817

Velocity of wind = 12 kilometres per hour = 200 m. per minute.
Thermal emissivity of leaf-surface in air of this velocity = 0·015 + 200 × 0·00017 = 0·0490 calorie.
Hence mean temperature of leaf *below* that of surroundings = $r/2e$ = 0·1817/0·0490 = 1°·84 C.

CASE B.—*Disposal of Energy Received by Leaf from Solar Radiation and from Heat Conveyed from Surroundings.*

R + r = 100.

w	Energy used for photosynthesis	0·72
W	,, ,, transpiration	80·38
W + w	Total energy expended in internal work ...	81·10
R − Ra	Solar energy transmitted by leaf	18 90
		100·00

During the time at my disposal I have only been able to give a brief outline of the general principles underlying an attempt to deal with the main functions of a foliage leaf from the point of view of its energetics, and I must refer those of my hearers who are specially interested in the subject to the papers themselves for the further elaboration of the argument and for the facts on which it is based. I trust, however, that this short account of the work may be sufficient to indicate that we have experimental means of studying quantitatively the reception of various grades of energy by a leaf, the proportion of this which is utilised for the two main kinds of internal work, and also the thermal relations of a leaf to its surroundings under given conditions.

In conclusion, I wish to anticipate a possible objection which may be raised on theoretical grounds to some of the views I have expressed. I have assumed throughout that the second law of thermodynamics is applicable to the phenomena we have been discussing. The statement of that law by Lord Kelvin limits its application to "inanimate objects," and doubtless if the living elements of the leaf-cells possess any power of dealing with the individual molecules of the surrounding medium so as to select and utilise the kinetic energy of those which are moving faster than the "mean square speed," it may well happen that a leaf may be able to perform some kind of internal work without there being any difference of mean temperature between it and its surroundings. In this event the views I have put forward would doubtless require some slight revision, but I think we may well wait until this restriction of the second fundamental principle of thermodynamics has received some experimental support.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

MR. H. O. ARNOLD-FORSTER, M.P., will distribute the medals, prizes, and certificates at Woolwich Polytechnic on Saturday, April 1.

DR. E. O. LOVETT, professor of mathematics of Princeton University, has been elected professor of astronomy in succession to Prof. C. A. Young.

THE Prince of Wales is to visit Cardiff toward the end of June, when he will lay the foundation stone of the Welsh University College in Cathays Park.

DR. PETER THOMPSON has been appointed professor of anatomy, and Prof. Arthur Dendy, of the South African College, Cape Town, professor of zoology, at King's College, London.

THE celebration of the jubilee of the Cheltenham Ladies' College and the opening by Sir Henry Roscoe of the new science laboratories and lecture rooms will take place on Friday and Saturday, May 12 and 13. The Marquis of Londonderry, President of the Board of Education, has promised to be present.

PRIVATE munificence has provided further sums for the promotion of higher education in the United States. We learn from *Science* that by the death of Mrs. George L. Littlefield, Brown University becomes the recipient of the bulk of the Littlefield estate, estimated at 100,000*l*. The will provides that the corporation shall apply the money as it sees fit, except that 20,000*l*. shall be used for the establishment of the George L. Littlefield professorship of American history. By the will of the late Mr. William F. Milton, of New York, his estate will go to Harvard University on the death of Mrs. Milton. The daily papers state that it is worth between 200,000*l*. and 400,000*l*. Columbia University has received 20,000*l*. from Mr. Jacob H. Schiff to endow a chair of social work, and the new professorship has been filled by the appointment of Dr. Edward T. Devine.

IN the House of Commons on Monday Mr. Clancy asked the First Lord of the Treasury whether there are any requirements, statutory or otherwise, in the case of grants in aid of university colleges in England, that four times the amount is required from local subscriptions before anything is derived from the public funds. In reply, the Chancellor of the Exchequer said that there has been such a requirement in regard to the grant in past times. But proposals in regard to the future allocation of the grant are now under the consideration of the Government. Mr. Clancy asked whether it was not proposed that there should be a grant of 100,000*l*. a year to the university colleges mentioned in the report; and whether there was any requirement, statutory or otherwise, in regard to this grant. The Chancellor of the Exchequer answered: There is a proposal by the committee that the distribution should be governed by the amount of voluntary subscriptions obtained by these colleges. The Government has not yet come to a decision on the subject.

AT a meeting of the Association of Teachers in Technical Institutes on March 25, Mr. W. J. Lineham, chairman of the association, delivered an address on technical training in

England. He insisted that in considering the future education of a boy who has completed his primary education—say, at thirteen—the subject must be regarded from the point of view of his future livelihood. Mr. Lineham sketched what he called an ideal scheme of technical education. After the child has followed a good primary education from the ages of six to thirteen, his education must be continued with some idea of his future occupation. If he is to be educated for a commercial pursuit he should now attend a purely secondary school; but if he is to enter a trade or technical profession he should attend what is known as a day technical school until the age of sixteen, having spent three years therein, the first part of which should be mainly literary, the middle scientific, and the last technical. His apprenticeship should then begin. But the apprentice must not now lose the lessons learnt in the technical day school. On the contrary, he must continue his studies to an even higher level by attendance at an evening technical school simultaneously with his apprenticeship. As to the apprenticeship itself, its character should entirely depend upon the trade or profession to be followed.

SOCIETIES AND ACADEMIES.

LONDON.

Anthropological Institute, March 14.—Sir T. H. Holdich, K.C.M.G., K.C.I.E., in the chair.—Manners and customs of the Melanesians: Rev. W. H. **Edgell.** The ethnographical objects and lantern slides shown included views of the different types of people, and illustrated the development of canoes and houses. One of the finest of the slides illustrated a Melanesian waiting to shoot a fish. He was poised on one leg, and the lecturer stated that he had seen natives waiting motionless for hours by the side of the rivers waiting for an opportunity to shoot. Of particular interest was the lecturer's statement that some of the natives have entirely lost the art of canoe making, although they still make paddles, which they use to propel rafts made of bamboos.

Entomological Society, March 15.—Mr. F. Merrifield, president, in the chair.—*Exhibits.*—Butterflies from Natal presented by Mr. G. A. K. Marshall to the Hope Department at Oxford: Dr. F. A. **Dixey.** Dr. Dixey read a note upon his experiments conducted with a view to ascertaining whether the assumption of the wet or dry season form of various African butterflies could be controlled by exposure in the pupal state to artificial conditions of temperature and moisture.—Drawings of the genitalia of noctuid moths, and also a number of slides showing the respective peculiarities of many members of the genus: F. W. **Pierce.** Among other things, attention was directed to the fact that in the case of the Tæniocampidæ the genitalia were widely dissimilar, while the author's investigations had led him to conclude that Ashworthii, at present ranked as an Agrotis, should more properly be included in the Noctua group.—A specimen of the North American longicorn, *Neoclytus erythrocephalus,* discovered in a sound ash tree in the neighbourhood of St. Helens, Lancashire: W. E. **Sharp.** Some palings of American ash in the vicinity suggested the origin of the progenitors of the colony, but it was not known how long they had been erected. The beetles were taken in their galleries in the summer dead, which seemed to indicate a weakening of the species under the conditions in which they found themselves. Mr. Sharp also showed examples of *Amara anthobia,* Valle, new to the British list (with a series of *A. familiaris,* Duf., and *A. lucida* for comparison) from Leighton-Buzzard, where they occurred not infrequently at the roots of grass in sandy places.—Mutilated Stenobothrus from the Picos de Europa, Spain: M. **Burr.** These grasshoppers were taken at a height of about 1300 metres, on turfy ground exposed to north wind from the Atlantic, and covered with tufts of a short, dense, tough, and spiky shrub, together with heather. Of the grasshoppers occurring on this spot, almost every specimen had the wings and elytra more or less mutilated, sometimes actually torn to shreds, entirely altering their appearance. A notable exception was *St. bicolor,* of which no single specimen was found mutilated.

PARIS.

Academy of Sciences, March 20.—M. H. Poincaré in the chair.—Thermochemical researches on brucine and strychnine: MM. **Berthelot** and **Gaudechon.**—A determination of the heats of combustion and formation of the two alkaloids, together with measurements of the heats of neutralisation with various acids. The equilibrium between strychnine and ammonium salts was also studied thermochemically.—On the variations of brightness and the total eclipses of primary images formed on the retina by very feeble luminous sources of constant value: A. **Chauveau.** A discussion of a recent paper by M. Lullin, in which the latter describes an experiment with phosphorescent screens, the visibility of which depends on the visual angle, and on the duration of the observation.—On the valency of the atom of hydrogen: M. **de Forcrand.** A discussion of the assumptions upon which the monovalency of hydrogen is based. The author brings forward the cases of Ag_2F, Ag_4O, ICl_3, and others, and suggests that the difficulty of explaining these can best be met by adopting the convention that the hydrogen atom is divalent.—On the photography of the solar corona at the summit of Mont Blanc: A. **Hansky.** Hitherto, attempts to photograph the solar corona at other times than during a total eclipse have not met with much success. By the use of a disc of blackened brass, the diameter of which is a little larger than that of the image of the sun at the focus of the telescope used, combined with coloured screens capable of absorbing the spectrum about up to $\lambda = 660\ \mu\mu$, photographs of the solar corona have been obtained.—Remarks on the preceding note: J. **Janssen.** Reproductions of two of the photographs mentioned in the preceding paper are given.—The notion of distance in the functional calculus: Maurice **Fréchet.**—On the calculation of closed arcs: M. **Pigeaud.**—The distribution and control of actions produced at a distance by electric waves: Edouard **Branly.** The three effects chosen for control at a distance by means of electric waves are the starting of an electric motor, lighting incandescent lamps, and producing an explosion. Details are given of the apparatus by which this has been done in the laboratory. The succession of the effects can be varied at will.—On the variation of the specific inductive power of glass with the frequency: André **Broca** and M. **Turchini.** Glass Leyden jars may be used in the production of currents of high frequency, between the limits 10^5 and 3×10^6 per second, on condition that the capacity introduced into the formulæ is about one-half that measured with charges of 0·1 sec., or 0·7 of the capacity measured with the frequency of an ordinary rotating sector.—On the coefficient of specific magnetisation and magnetic susceptibility of salts: Georges **Meslin.** The results of measurements for a considerable number of paramagnetic and diamagnetic salts are given.—On photographic halation. Reply to a note of M. A. Guébhard: P. **Villard.** The author regards the explanation of his experiments given by M. A. Guébhard as inapplicable. Particulars of an experiment are given for which an explanation is at present wanting.—On the ionisation produced between parallel plates by the radium emanation: William **Duane.**—The diazoamines of diphenylamine, derivatives of the homologues of aniline and naphthylamines: Léo **Vignon** and A. **Simonet.**—The characterisation of lactones by means of hydrazine: M. **Blaise** and A. **Luttringer.** The lactone is heated on the water bath with a slight excess of hydrazine hydrate. The crystalline mass which separates on cooling is re-crystallised from boiling ethyl acetate, and its melting point, which is usually well defined, serves to characterise the lactone. The melting points of six of these compounds are given.—On menthone derived from the hexahydrothymols: Léon **Brunel.** In a preceding note the preparation of two thymomenthols has been described; the present paper describes the thymomenthone obtained by the oxidation of these products.—On monobromoacetal: P. **Freundler** and M. **Ledru.** By attention to some details the yield of bromoacetal by Fischer's method has been raised from 50 per cent. to 115 per cent. of the acetal employed. Magnesium reacts violently on this bromine compound at 110°, giving rise to vinyl ethyl ether.—Remarks on the diphenylamine reaction with nitric acid: Isidore **Bay.** The blue coloration is produced by a large number of oxidising